Fruit Life-Time Prediction

By:

Abdul Rehman
23313
Muhammad Furqan
27659
Qazi Faheem Ullah
23311

Supervised by:

Imran Khan

Faculty of Computing
Riphah International University, Islamabad
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Date: [date of final presentation]

Final Approval

This is to certify that we have read the report submitted by **Abdul Rehman *()***, for the partial fulfillment of the requirements for the degree of the Bachelors of Science in Computer Science (BSSE). It is our judgment that this report is of sufficient standard to warrant its acceptance by Riphah International University, Islamabad for the degree of Bachelors of Science in Computer Science (BSSE).

Committee:

1 _____

Imran khan
(Supervisor)

2 _____

(Head of Department)

Declaration

We hereby declare that this document "**Fruit Life-Time Prediction**" neither as a whole nor as a part has been copied out from any source. It is further declared that we have done this project with the accompanied report entirely on the basis of our personal efforts, under the proficient guidance of our teachers, especially our supervisor **Imran Khan**. If any part of the system is proved to be copied out from any source or found to be reproduction of any project from anywhere else, we shall stand by the consequences.

Abdul Rehman
23313

Muhammad Furqan
27659

Qazi Faheem Ullah
23311

Dedication

We dedicate our work to our teachers, family, and friends. The peerless encouragement from our teachers and prayers from our parents is what leads to the success of our final year project. We dedicate our work to our supervisor Imran Khan and the respected faculty members.

Acknowledgement

First of all, we are obliged to Allah Almighty the Merciful, the Beneficent, and the source of all Knowledge, for granting us the courage and knowledge to complete this Project.

We are grateful to our respected supervisor **Imran Khan**, we are highly obliged for his consideration, and the suggestions he gave us to make our project a masterpiece. Also, a special thanks to the rest of the faculty members for their unconditional support. We are thankful to our parents for the love and encouragement they provided us with throughout the project.

Abdul Rehman
23313

Muhammad Furqan
27659

Qazi Faheem Ullah
23311

Abstract

This report documents the development of the system "**Fruit Life-Time Prediction**", an android application that uses artificial intelligence to detect various fresh and rotten fruit. Accurate prediction of fruit shelf life is critical for minimizing food waste and optimizing supply chain management.

In this study, we propose a Convolutional Neural Network (CNN) model to classify fresh and rotten fruits and predict their remaining shelf life. The model is trained on a comprehensive dataset containing images of various fruits at different stages of freshness, along with their corresponding shelf life labels. Advanced image processing techniques and data augmentation enhance the model's robustness and generalizability. The CNN architecture is designed to capture intricate visual patterns associated with fruit decay, enabling the prediction of both the current state of freshness and the remaining shelf life. Experimental results demonstrate the model's high accuracy in classifying fresh versus rotten fruits and its effectiveness in shelf life prediction, outperforming traditional methods. This approach offers a valuable tool for stakeholders in the agricultural and retail sectors, facilitating better inventory management and reducing food spoilage.

Table of Contents

Table of Contents i
List of Table iii
List of Figures 1
1.1 Introduction 3
1.2 Goals and Objectives 3
1.3 Scope of the Project 4
1.4 Summary 4
Literature Review 6
2.1 Introduction 6
2.2 Background and Problem Elaboration 6
2.3 Detailed Literature Review 7
2.3.1 Definitions 7
2.3.2 Related Research Work 1 8
2.3.3 Related Research Work 2 9
2.4 Literature Review Summary Table 10
2.5 Research Gap 11
2.6 Problem Statement 12
3.1 Requirements 15
3.1.1 Requirement Elicitation Techniques: 15
3.2 Functional Requirements 16
3.2.1 Functional Requirements 16
3.2.2 Non-Functional Requirements 16
3.3 Proposed Methodology 16
3.3.1 Data Collection 16
3.3.2 Preprocessing 17
3.3.3 Model Selection 17
3.3.4 Model Training: 17
3.3.5 Integration of Freshness Detection: 17
3.3.6 Deployment and Integration: 18
3.5 System Architecture 18
3.6 Use Cases 19
3.7 Sample Use Case Name Here 20
3.7.1 User Login 20
3.7.2 Detect Fruit 21
3.7.3 User Sign Up 21
3.7.4 Update Profile 22
3.7.5 Admin Forget Password 23
3.7.6 View Result 24
3.7.7 Logout User 25
3.8 Database Design 26
3.8 Sequence diagram 27
3.8.1 User Signup 27
3.8.2 User Login 28
3.8.4 User Forgets Password 29
3.8.5 Take Image 30
3.8.6 Logout 31
CNN Architecture diagram 31
Chapter 4: Implementation 33
4.1 Endeavor 33

4.1.1 Team 33
4.1.2 Roles & Responsibility Matrix: 33
4.2 Component, Libraries, Web Services and Stub 34
4.2.1 Flutter 34
4.2.2 TensorFlow 34
4.2.3 Keras 34
4.3 IDE, Tools and Technologies 34
4.4 Database 34
4.5 Best Practices/ Coding Standards 35
4.6 Deployment Environment 35
Chapter 5: Experimental Result and Analysis 37
5.1 Introduction 37
5.2 Experimental Steps 37
5.2.1 Working of CNN 38
5.3 Accuracy and Result 38
5.3.1 Confusion matrix 39
5.4 Summary 39
Chapter 6: Conclusion and Outlook 41
6.1 Introduction 41
6.2 Achievements and Improvements 41
6.3 Critical Review 41
6.4 Future Recommendations/Outlook 41
6.5 Summary 42
Reference 43

List of Table

Table 2.1: Literature Review 1 10

Table 2.2: Research Gap 1 12

Figure 3.1: Use Case 1 19

Table 3.2: User Login 1 20

Table 3.3: Update Profile 1 22

Table 3.4: Admin Forget Password 1 23

Table 3.5: View Result 1 24

Table 3.6: Logout User 1 25

Table 4.1: Responsibility Matrix 1 33

List of Figures

Figure 3.1: Use Case 1 19

Figure 3.2: Database Diagram 1 26

Figure 3.3: User Signup 1 27

Figure 3.4: User Login 1 28

Figure 3.5: User Forget Password 1 29

Figure 3.6: Take Image 1 30

Figure 3.7: Logout 1 31

Figure 3.8: CNN Diagram 1 31

Figure 4.1: Deployment Environment 1 35

Chapter 1:

Introduction

1.1 Introduction

Our project aims to revolutionize fruit classification, shelf-life identification through advanced technology. We use artificial intelligence and computer vision to solve the biggest challenges in the agricultural and food industries Our goals include developing accurate fruit classification systems, shelf life determination, rotten fruit detection, and implementing quality standards through automated methods and objective analysis, we strive in order to increase food safety, reduce waste and improve customer satisfaction. The last paragraph of the introductory chapter should contain details of the entire report. Summarize each chapter in one paragraph and give a final paragraph.

1.2 Goals and Objectives

Our goal is to develop a mobile application that uses image recognition technology to enable users to make informed decisions when purchasing fruits, thus reducing food waste and ensuring availability the highest level.

Use image recognition algorithms that can detect signs of wear, discoloration, mold, or irregular textures when users point their smartphone cameras at pods. Developing analytical systems for factors such as fruit appearance, temperature, and management to estimate fruit shelf life can provide and provide valuable information to growers, distributors and retailers improved supply chain delivery and reduced waste

Develop a standardized system for classifying fruits into attributes based on criteria such as appearance, firmness and aroma, to enable users to distinguish between healthy fruits, between freshest, and overripe or spoiled

Provide easy-to-navigate and understand program design, ensuring access to a wide range of people including farmers, wholesalers, retailers and consumers Provide pricing information for a variety of fruit types to enable users make informed purchasing decisions based on preferences and economic constraints, promote fair prices and provide confidence in the market.

1.3 Scope of the Project

Users can factor their telephone digital camera at a specific fruit to decide its freshness. Using photo detection generation, the app can come across signs of deterioration, along with discoloration, mould, or irregular shapes. This characteristic facilitates purchasers make informed decisions while purchasing fruit, reduces meals waste, and guarantees excessive high-quality products.

By studying such elements as the arrival, temperature, and use of the fruit, the app can estimate its closing life. This facts is valuable for farmers, vendors and stores to control inventory, lessen waste and optimize supply chains.

The utility can classify the fruit into extraordinary attributes based totally on standards including appearance, firmness and aroma. Users can easily distinguish among healthful, most up to date fruit and overripe or spoiled fruit. This feature empowers consumers to make more healthy alternatives and facilitates suppliers keep regular standards.

Easy-to-use interface: The app is designed to be simple and easy to apply in thoughts. Flexible controls and clean visual signage make it reachable to a wide range of customers which include farmers, wholesalers, stores and clients. This makes them greater appropriate and greater influential among neighborhood farmers and fruit shoppers. In addition to gaining knowledge of the great fruits, the app provides price data for numerous end result. Users can examine prices throughout different attributes and make shopping choices primarily based on their alternatives and budget constraints. This transparency advantages each shoppers and dealers through selling fair costs and building self belief inside the market.

1.4 Summary

Our project aims to revolutionize fruit classification, shelf life identification and characterization through advanced technologies, in particular the benefits of artificial intelligence and computer vision. By addressing key challenges in the agri-food industry, we strive to increase food safety, reduce waste and improve customer satisfaction. The objectives include developing an accurate fruit classification system, identification, identification of rotten fruits, and implementation through practical and objective analysis our approach aims to provide a solution a further will provide to modernize fruit quality assessment and have a positive impact on the overall fruit supply chain.

Chapter 2:

Literature Review

Literature Review

2.1 Introduction

The literature assessment explores present studies and technologies relevant to fruit classification, shelf-lifestyles detection. Various research have highlighted the importance of correct fruit evaluation for making sure meals protection, decreasing waste, and improving consumer pleasure. Research in fruit category has centered on both conventional methods, consisting of guide sorting based on visible inspection, and current strategies, inclusive of pc imaginative and prescient and system gaining knowledge of algorithms. These technologies permit computerized type of fruits primarily based on factors along with size, shape, coloration, and texture, leading to extended efficiency and consistency in sorting procedures.

In the area of shelf-life detection, severa studies have investigated factors influencing fruit spoilage and rot, which includes temperature, humidity, coping with practices, and storage conditions. Advanced sensor technologies and predictive modeling processes had been evolved to estimate the ultimate shelf lifestyles of culmination, permitting farmers, distributors, and shops to optimize inventory control and decrease losses due to spoilage.

2.2 Background and Problem Elaboration

In the agriculture and food industries, the accurate evaluation of fruit excellent performs a pivotal role in making sure meals safety, decreasing waste, and assembly purchaser demands. Traditionally, fruit first-class assessment has trusted subjective techniques, which include visual inspection and manual sorting, that are hard work-in depth, time-ingesting, and vulnerable to inconsistencies. Moreover, with the increasing worldwide call for for clean produce and the complexity of deliver chain logistics, there's a developing need for green and dependable techniques to classify fruits, locate shelf-life, and grade fine.

One of the important thing challenges faced in fruit first-rate evaluation is the subjective nature of traditional techniques, which rely closely on human judgment and are vulnerable to biases and mistakes. Additionally, elements including variability in fruit characteristics, environmental conditions, and coping with practices further complicate the assessment method, main to inefficiencies and inaccuracies in fruit sorting and grading.

Another important issue is the dearth of standardized grading structures throughout specific regions and markets, resulting in discrepancies in fine requirements and pricing practices. This inconsistency hampers transparency and equity inside the marketplace, leading to challenges for each manufacturers and consumers in assessing the real fee and excellent of fruits.

Furthermore, the restricted capability to correctly are expecting the shelf lifestyles of end result poses considerable demanding situations for farmers, distributors, and retailers in managing stock and minimizing losses due to spoilage. Without dependable strategies for shelf-existence detection, stakeholders are often compelled to depend upon conservative estimates or manual inspections, which may bring about suboptimal decisions and elevated meals waste.

Addressing those demanding situations requires modern answers that leverage superior technologies, inclusive of synthetic intelligence and pc imaginative and prescient, to automate fruit best evaluation procedures. By growing strong algorithms and structures for fruit classification, shelf-existence detection, and great grading, we will enhance performance, accuracy, and transparency across the complete fruit deliver chain, ultimately enhancing food protection, reducing waste, and enhancing customer pride.

2.3 Detailed Literature Review

2.3.1 Definitions

A Detailed Literature Review for fresh and rotten fruit detection includes an intensive examination of current research, research, and methodologies approximately the identification and differentiation of sparkling and rotten culmination the usage of numerous strategies, inclusive of however no longer limited to synthetic intelligence, pc vision, spectroscopy, and sensor technologies. This type of literature assessment aims to comprehensively analyze the ultra-modern techniques, challenges, and improvements in the discipline to inform the development of effective and accurate detection structures.

Review of Detection Techniques: An review of various strategies used for sparkling and rotten fruit detection, which includes visual inspection, spectroscopic evaluation, chemical sensors, and imaging technologies.

Analysis of AI and Computer Vision Approaches: Examination of AI and laptop imaginative and prescient algorithms hired for automatic fruit first-class evaluation, consisting of image popularity, pattern reputation, and system learning techniques.

Comparative Analysis of Methods: Comparative evaluation of the strengths, barriers, and overall performance metrics of various detection methods in terms of accuracy, pace, scalability, and practicality for real-world programs.

Accuracy: Investigation of factors influencing the accuracy and reliability of sparkling and rotten fruit detection, which includes environmental situations, fruit varieties, storage conditions, and pattern training techniques.

2.3.2 Related Research Work 1

Read greater about Fresh and Rotten Fruits Classification Using CNN and Transfer Learning the classification of fresh and rotten fruits is one of the key methods in agricultural fields, which affects meals protection, quality warranty, and purchaser pleasure directly. With the fast development of deep getting to know techniques in current years, it has grow to be a brand new trend to apply such fashions, mainly convolutional neural networks in automatic fruit type.

We presented a brand new CNN-based structure that's specially designed for classifying fresh and rotten fruits in our work. We advanced transfer getting to know fashions (VGG16, VGG19 MobileNet and Xception) similarly to our novel CNN version constructed from scratch and compared their accuracies. We additionally studied how hyperparameters as an instance batch length, epochs, optimizer and gaining knowledge of price effect the performance of this version.

In our consequences, we determined that the proposed CNN version carried out an accuracy of ninety seven.Eighty two%, which was higher in classifying clean and rotten fruits compared to transfer mastering models. This highlights the capacity of CNNs to automate this technique and minimise human errors associated with guide inspection. Our method, which employs convolutional neural network models, at the beginning simplifies the classification method and will increase the accuracy and efficiency of fruit quality evaluation tasks.

Deep gaining knowledge of techniques have also been used on this field for the class of fruits [7]. Different architectures of CNN, optimization strategies, and dataset processing methods were explored in order to attain an accurate and reliable classifcation. In addition, new imaging modalities like hyperspectral imaging and multispectral imaging have been investigated to detect fruit excellent.

Overall, the development of CNN-based models for fruit classification represents a significant advancement in agricultural technology, offering potential benefits for farmers, distributors, retailers, and consumers. By automating the classification process and improving accuracy,

these models contribute to enhancing food safety, reducing waste, and promoting sustainable agricultural practices.

2.3.3 Related Research Work 2

Fruit classification is a fundamental but urgent task in all sectors of the fruit industry for inventory management, pricing and quality control process (soda massey). Classifying fruits correctly not only assist vendors in supermarkets to figure out which kind of fruit it is, but also helps for pricing decisions based on quality. In addition, because exporting new foods on time is also important for avoiding economic loss, having fruit classification systems is very crucial [4].

Recently, while a lot of research is being done in the field of machine learning and Computer Vision technologies based fruit classification systems. Such systems can increase the efficiency of fruit classification and reduce reliance on human labor, especially for agriculture. These systems can aid, efficiency and reduce cost by automating the clasiffication of fresh and rotting fruits.

Several research have proved the state of art performance of machine learning models in fruit classification, most notably convolutional neural networks. Different CNN architectures have been studied and applied in these trials with different dataset sizes and preprocessing data as well to obtain reliable classification performance. Moreover, the scientists also studied ways of embedding fruit classification systems into autonomous agricultural robots and also in the form smartphone applicational solutions.

For this study, a total of 5658 fruit images were used in 10 classes to train and test the model for fruit classification. The models of the proposed system were five CNNs and InceptionV3 was achieved a highest accuracy slightly which is 97.34%. This underscores the possibility that CNN based approaches can help in classifying patterns of fruits effectively and minimizing human efforts and cost incurred on manual classification processes.

2.4 Literature Review Summary Table

Table 2.1: Literature Review 1

Sr.no	Author	Work	Publish date
1	Reka, S.S., Bagelikar, A., Venugopal, P., Ravi, V. and Devarajan, H.	Deep Learning-Based Classification of Rotten Fruits and Identification of Shelf Life.	30 January 2024
2	Jana, S., Parekh, R., & Sarkar, B.	Detection of Rotten Fruits and Vegetables Using Deep	2021
3	Miah, M. S., Tasnuva, T., Islam, M., Keya, M., Rahman, M. R., & Hossain, S. A(IEEE)	An advanced method of identification fresh and rotten fruits using different convolutional neural networks	2021
4	Zhu, Z., Zhao, Y., Guo, Y., Zhang, R., Pan, Y., & Zhou, T.	A novel additional carbon source derived from rotten fruits: Application for the denitrification from mature landfill leachate and evaluation the economic benefits.	2021
5	Palakodati, S. S. S., Chirra, V. R. R., Yakobu, D., & Bulla, S	Fresh and Rotten Fruits Classification Using CNN and Transfer Learning.	12 October 2020
6	Nosseir, Ann; Ahmed, Seif Eldin Ashraf	Automatic Classification for Fruits' Types and Identification of Rotten Ones using k-NN and SVM.	2019

2.5 Research Gap

While several mobile applications exist for fruit detection and identification, there are notable research gaps in the functionality and capabilities of these apps:

Lack of Grading Feature: The majority of existing apps focus solely on fruit detection, with limited or no functionality for grading fruits based on quality attributes such as ripeness, freshness, or appearance. This gap suggests a need for mobile applications that can provide comprehensive grading capabilities to assist users in selecting the highest quality fruits.

Limited Automation for Rotten/Fresh Detection: While a few apps provide detection of rotten or clean end result, the manner often calls for manual input or subjective assessment from the user. There is an opening inside the development of completely computerized systems that may appropriately and reliably distinguish between rotten and sparkling fruits in real-time, without user intervention.

Integration of Prediction Models: While a few apps offer prediction functions for fruit shelf lifestyles or satisfactory, there is a gap in integrating predictive models without delay into detection and grading functionalities. Mobile packages that seamlessly integrate detection, grading, and predictive abilties could provide users with extra actionable insights and choice-making assist.

Variability in Accessibility and Pricing: Existing apps range in terms of accessibility and pricing fashions, with a few being unfastened while others are paid. However, there's a lack of consistency in the functions and exceptional presented across both unfastened and paid apps. This gap highlights the need for standardized pricing models and clearer differentiation among loose and paid variations based on functionality and price-brought features.

Table 2.2: Research Gap 1

SR	App Name	Paid / Free	Detection	Grading	Rotten / Fresh
01	Fruit Identifier	paid	✓	✕	✕/✕
02	Fruit name with picture	Free	✓	✕	✕/✕
03	Fresh Fruit Detector	Paid	✓	✕	✕/✕
04	Fruit vegetable snap	Free / Paid	✓	✕	✕/✕
05	Fruit life-time Prediction	Free/Paid	✓	✓	✓/✓

2.6 Problem Statement

The presence of rotten culmination poses a huge danger to meals safety and public fitness. Rotten culmination can harbor harmful micro organism, molds, and other microorganisms which have the potential to reason food poisoning and different illnesses in customers. When fruits begin to rot, they go through chemical and biological modifications that create a super surroundings for the growth and proliferation of pathogens.

Consuming rotten end result contaminated with pathogenic microorganisms can cause quite a number damaging health effects, including gastrointestinal infections, nausea, vomiting, diarrhea, and in intense instances, greater critical headaches consisting of dehydration and organ failure. Infants, younger children, the aged, and people with weakened immune systems are mainly vulnerable to the fitness risks associated with consuming infected meals.

Furthermore, the presence of rotten end result inside the food deliver chain will have broader financial and societal implications. Contaminated fruits can result in food recalls, market withdrawals, and loss of consumer confidence, leading to financial losses for producers, distributors, and retailers. Additionally, outbreaks of foodborne illnesses linked to rotten fruits can strain healthcare systems and impose significant burdens on public health resources.

Chapter 3:

Requirement and design

Requirements and Design

In this chapter, we discuss all the non-functional and functional requirements of fresh and rotten fruit detection. Before that, we will discuss all the problems statement that we have found while researching the project idea. Fresh and rotten fruit detection withholds many functional requirements. These requirements are gathered through various requirement-gathering techniques involving Brainstorming, Interviewing, and Observing. The non-functional requirements are drawn by observing the gathered requirements and type of our system.

3.1 Requirements

3.1.1 Requirement Elicitation Techniques:

Different Requirement Elicitation Techniques were used to gather and review different opinions of customers. This has helped us produce a clear straight path in developing an application that will be helpful to most customer demand.

3.1.1.1 Existing system

We study the existing systems to know that what kind of features present in them and how much they are useful for patients. Most of the system provides essential feature but some were not properly addressed. Many gaps were identified which led us to create an app that will be made according to the customer's demand.

3.1.1.2 Brainstorming

Helped us bring possible features to reality after reading and analyzing different systems and through constant research on increasing the efficiency of the system and how we can integrate an algorithm that provides accurate results.

3.1.1.3 Interviews

Our vital source for gathering requirements, we met different Eye doctors from our city and inquired about different problems they face. They helped us in Elements Descriptions understand the whole process of different eye diseases and their medication and process of treatment.

3.1.1.4 Wire Framing

We created a wireframe to help us understand the requirements and get consensus on the workflow. Complete system wireframes allowed us to anticipate the user interface. The technology we used for designing wireframes is Figma.

3.2 Functional Requirements

The functional requirements of the fresh and rotten fruit AI system outline the specific features and functionalities essential for the system to effectively fulfill its purpose and meet the needs of its users. These requirements describe the desired behaviors and interactions of the system, ensuring that it provides a seamless and user-friendly experience.

3.2.1 Functional Requirements

FR.1: Users should be able to create an account and login to the app.
FR.2: Users should be able to detect fruit through pic.
FR.3: Users should be able to check the result.
FR.4: Users shall be able to provide feedback on the app
FR.5: User should be able to check fruit life.
FR.6: User should be able to logout.

3.2.2 Non-Functional Requirements

N-FR.1: The app shall be designed to handle a large number of users.
N-FR.2: The app shall be compatible with multiple devices.
N-FR.3: The app shall have a user-friendly interface, with easy navigation design.

3.3 Proposed Methodology

3.3.1 Data Collection

Gather a complete dataset of fruit photographs containing examples of both fresh and rotten fruits. Include a numerous variety of fruit kinds and situations to ensure the model's robustness

and generalization capacity. Annotate the dataset to signify the freshness reputation of each fruit picture clean or rotten.

3.3.2 Preprocessing

Perform information preprocessing strategies such as resizing, normalization, and augmentation to beautify the first-class and variety of the dataset. Apply strategies to address not unusual demanding situations in fruit picture evaluation, which includes background litter, lights variations, and occlusions. Consider strategies for boosting assessment, lowering noise, and improving photo readability to facilitate accurate detection.

3.3.3 Model Selection

Explore numerous deep mastering architectures suitable for image category and item detection obligations, together with convolutional neural networks (CNNs) and object detection frameworks like YOLO or Faster R-CNN. Select a model or combination of fashions that offer excessive accuracy and efficiency in detecting sparkling and rotten culmination.

3.3.4 Model Training:

Split the annotated dataset into education, validation, and trying out units to educate and examine the performance of the fashions. Fine-music the selected model on the fruit image dataset to optimize detection accuracy and limit fake positives/negatives. Experiment with transfer learning strategies using pre-educated fashions to leverage understanding from huge-scale photo datasets.

3.3.5 Integration of Freshness Detection:

Implement algorithms for detecting freshness signs in fruit pix, inclusive of color changes, texture irregularities, and presence of mold or decay. Incorporate feature extraction and classification strategies to distinguish among clean and rotten end result based totally on visible cues. Ensure that the detection method is efficient, scalable, and capable of managing actual-time inputs from various assets.

3.3.6 Deployment and Integration:

Develop a consumer-friendly interface for the freshness detection machine, permitting customers to add pix and receive real-time feedback on the freshness fame of end result. Integrate the trained model into the backend of the device, ensuring scalability, reliability, and efficiency in processing image inputs. Deploy the finalized freshness detection machine for realistic packages in agricultural production, meals processing, retail, and customer services.

3.5 System Architecture

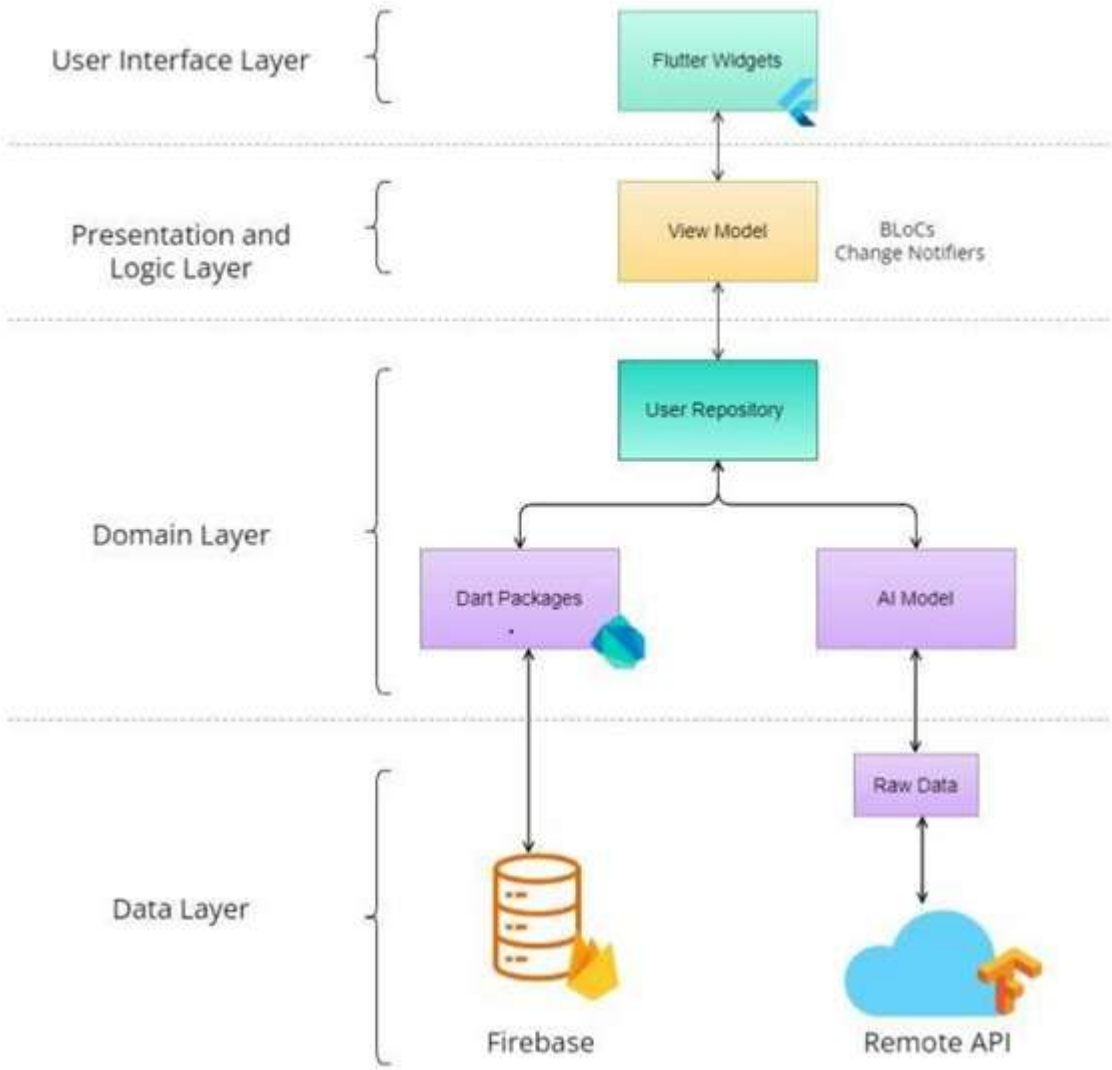


Figure 3.2 1 architecture

3.6 Use Cases

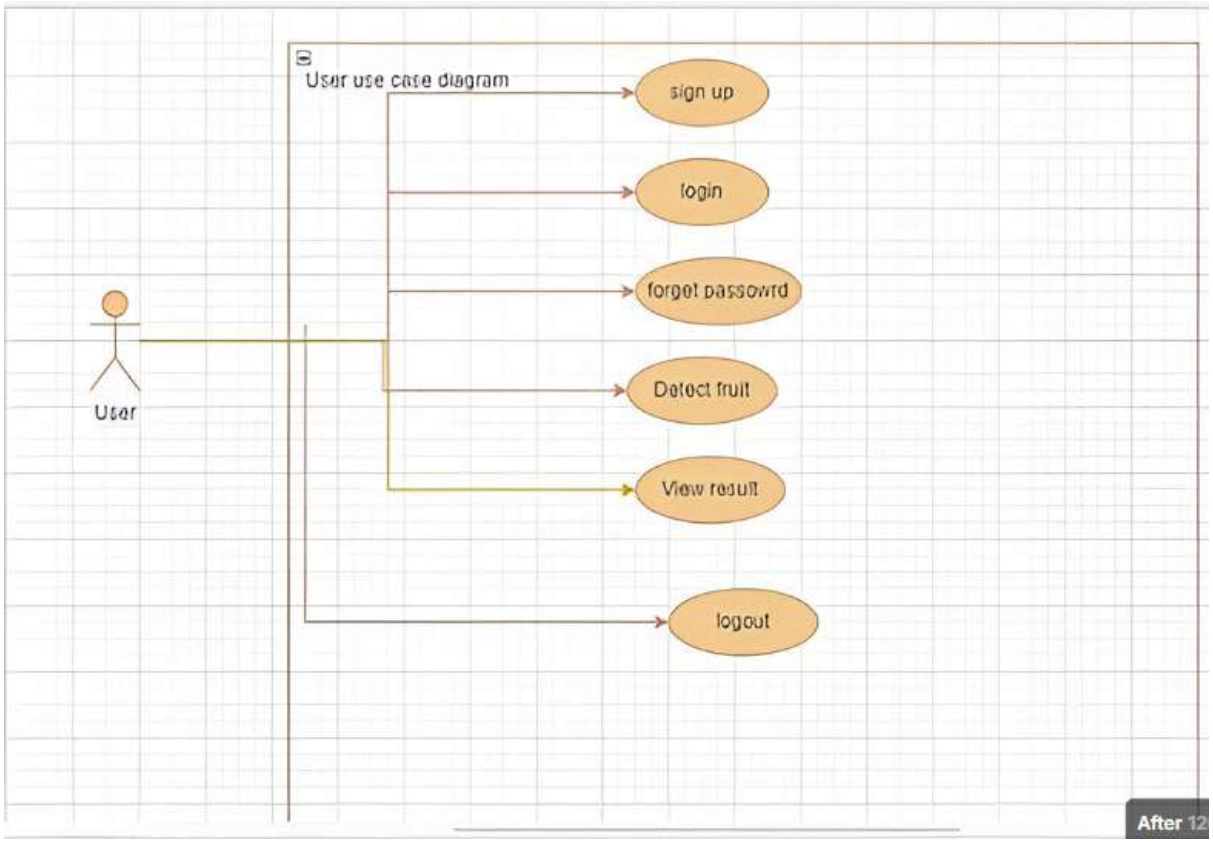


Figure 3.1: Use Case 1

3.7 Sample Use Case Name Here

3.7.1 User Login

Table 3.1: User Login 1

Use Case ID	**UC-1**
Use Case	**User Login**
Description	This use case show the steps and interactions involved when an administrator logs into the system.
Actors	User
Preconditions	The system is running.
Main Flow	1. User navigates to the login page. 2. System show the login form. 3. User write the username and password. 4. System verifies the credentials. 5. Credentials are valid, the system grants access to the User features. 6. If the credentials are invalid, an error message is displayed, and the User is prompted to re-enter the information.
Post conditions	• If successful, the User is logged into the system and gains access to User functionalities. • If unsuccessful, the User remains on the login page.
Alternative Flows	None

3.7.2 Detect Fruit

Use Case ID	**UC-1**
Use Case	**Detect Fruit**
Description	This use case show the Steps to Detect Fruit from pic of Fruit
Actors	User
Preconditions	The system is Predicting.
Main Flow	1. User Press Button to Detect Fruit . 2. System show option of Camera or Gallery. 3. In both options System Detects Fruit . 4. It Classifies which Fruit it is . 5. And also Its Shelf Life . 6. If Something Other than Fruit it show other
Post conditions	• It detects fruit successfully
Alternative Flows	None

3.7.3 User Sign Up

3.3: User Sign Up 1

Use Case ID	**UC-2**
Use Case	**User Sign-Up**

Description	In this use case outlines the steps and interactions when a new user signs up for the system.
Actors	User
Preconditions	The system is running.
Main Flow	1. User navigates to the sign-up or registration page. 2. System presents the user registration form. 3. User enters the required details such as name, contact information, and creates a username and password. 4. System verifies the entered information. 5. If a new User account is created, and an acknowledgment message is displayed. 6. System may send a confirmation email to the User for account activation.
Post conditions	● The new User account is created.
Alternative Flows	If the information is not valid, the system shows an error message, and the User is prompted to correct the information.

3.7.4 Update Profile

Table 3.4: Update Profile 1

Use Case ID	**UC-3**
Use Case	**Update Profile**
Description	This use case outlines the steps and interactions when a patient updates their profile information
Actors	User
Preconditions	• The system is running. • The User is logged into the system
Main Flow	1. User navigates to the "Profile" or "Settings" section. 2. System displays the User's current profile information. 3. User modifies the desired profile information (e.g., contact details, address). 4. System verifies the updated information.

	5. If valid, the system updates the User's profile. 6. System sends a confirmation notification to the User. .
Post conditions	● The User's profile information is successfully updated.
Alternative Flows	● If there are issues with the updated information, the system informs the User and prompts for correction.

3.7.5 Admin Forget Password

Table 3.5: Admin Forget Password 1

Use Case Name	**Admin Forgot Password**	
Use case ID	**UC-04**	
Level	**User Level**	
Primary Actor	User	
Stakeholders And Interests	User will be able to change password if he/she forgot the login credentials.	
Precondition	User will provide all the required information to process the reset password request.	
Post condition	User will be able to change the password successfully.	
	Action	**Response**

Main Success Scenario	This use case initiates by the User when he/she forgot the password of the system. 1. User clicks on forgot password button in User panel. 3. User enters mandatory information such as email of the registered account.	2. System displays forgot password form. 4. System checks the formats and credentials entered by User. .

3.7.6 View Result

Table 3.6: View Result 1

Use case Name	**View Result**	
Use case ID	**UC-05**	
Level	**User Level**	
Primary Actor	User	
Stakeholders And Interests	User will get result after detection.	
Precondition	User will provide the image to get results.	
Post condition	User can view results.	
Main Success Scenario	**Action**	**Response**
	This use case initiates by the User when he/she wants to View Result on system. 1. User clicks on View Result button in User panel. 3. User can take screenshot to save the Results.	2. System displays results.

Alternative Scenario	None
Technical Requirements	User must have a mobile device and internet connection and after image detection so he/she can view their results

3.7.7 Logout User

Table 3.7: Logout User 1

Use case Name	Logout User	
Use case ID	**UC-06**	
Level	**User Level**	
Primary Actor	User	
Stakeholders And Interests	User will logout from the system whenever he/she want.	
Precondition	User should be signed into the system.	
Post condition	User will successfully logout from the system.	
Main Success Scenario	**Action**	**Response**
	This use case initiates by the user when he/she wants to Logout on system. 1. User clicks on Logout button in user panel. 3.User press logout option on the app	2. System displays “logout” and “cancel” option 4.system successfully logout user
Alternative Scenario	None	
Technical Requirements	User must have Android mobile device capable to run Android version 12 or more and stable internet connection.	

3.8 Database Design

Firebase is a NoSQL database. There aren't any tables or rows like in a SQL database. Rather, information is kept in papers that are arranged into collections. Therefore, instead of designing an Entity Relationship Diagram, we have designed a Data Model Diagram to represent the collections and the document visually made inside those collections. Collections must be used to hold all papers.

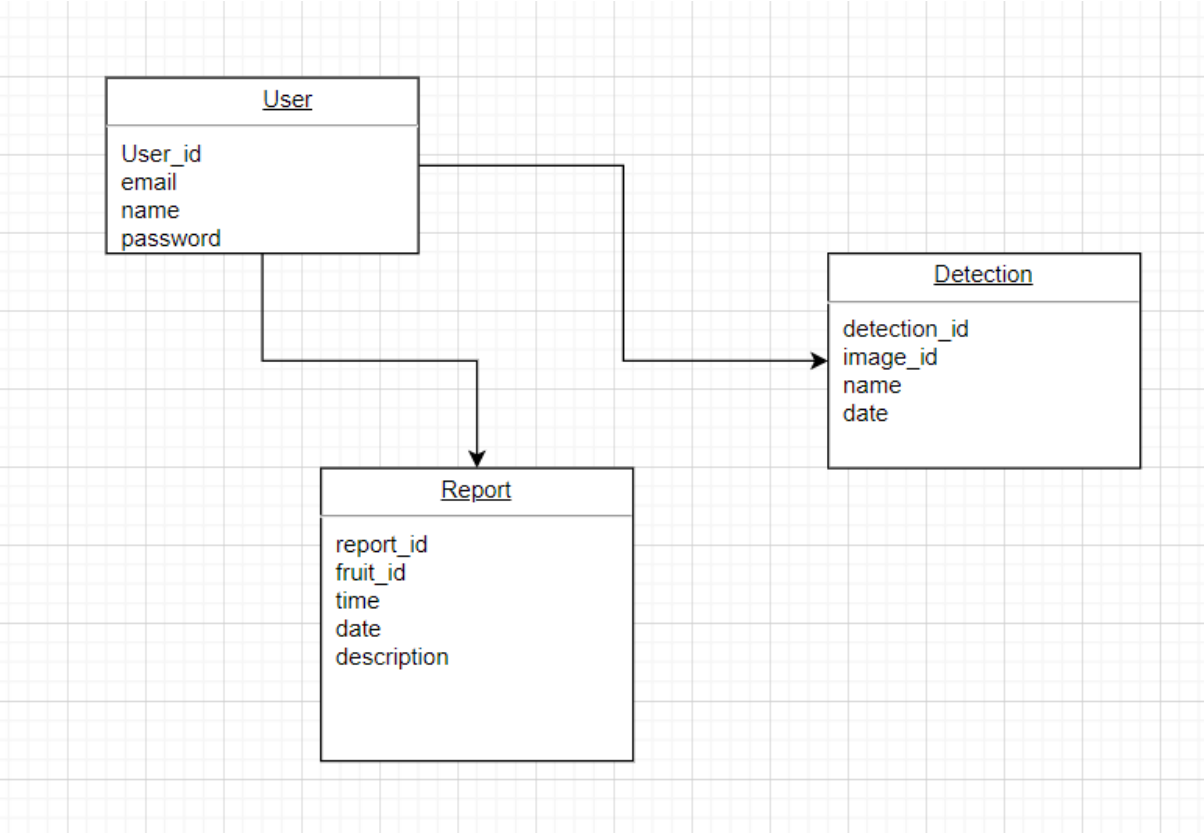


Figure 3.2: Database Diagram 1

3.8 Sequence diagram

3.8.1 User Signup

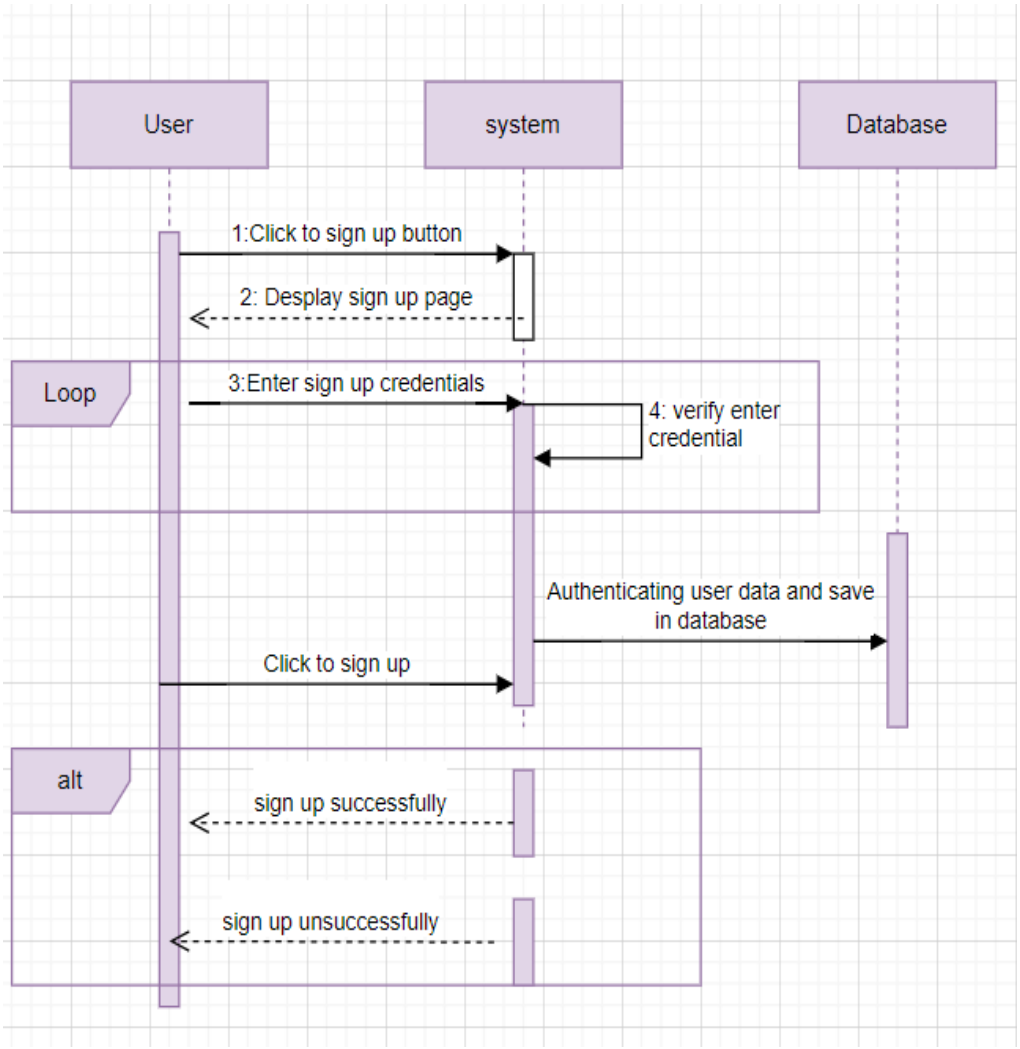


Figure 3.3: User Signup 1

3.8.2 User Login

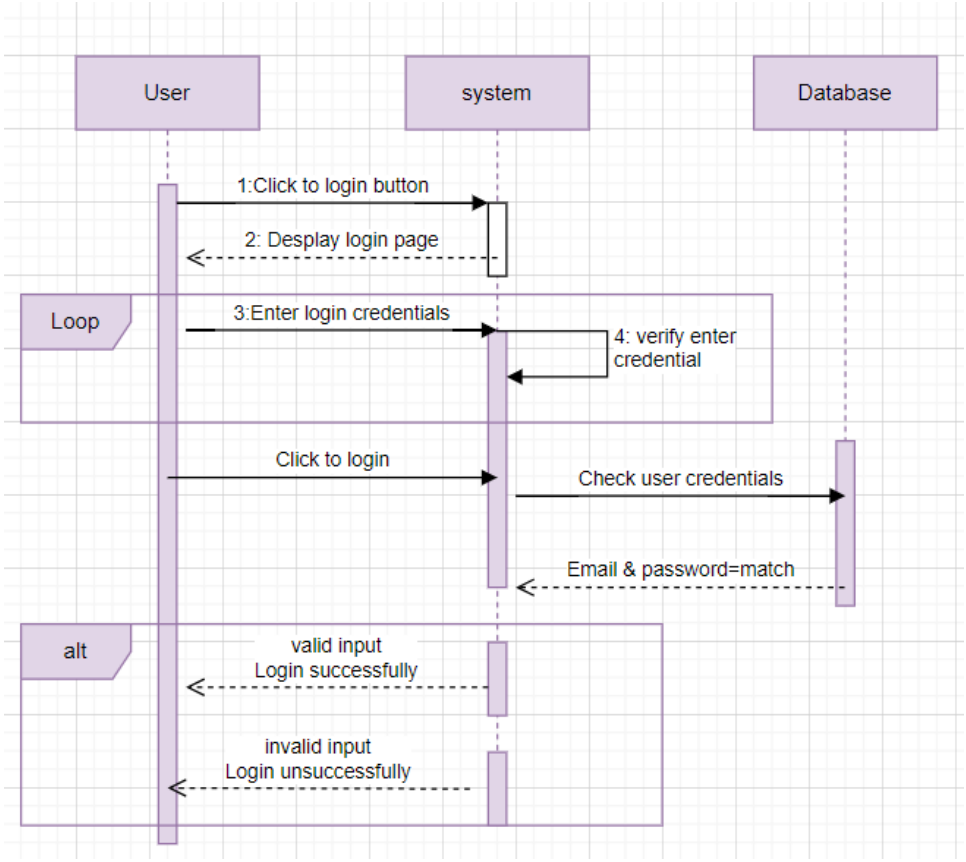


Figure 3.4: User Login 1

3.8.4 User Forgets Password

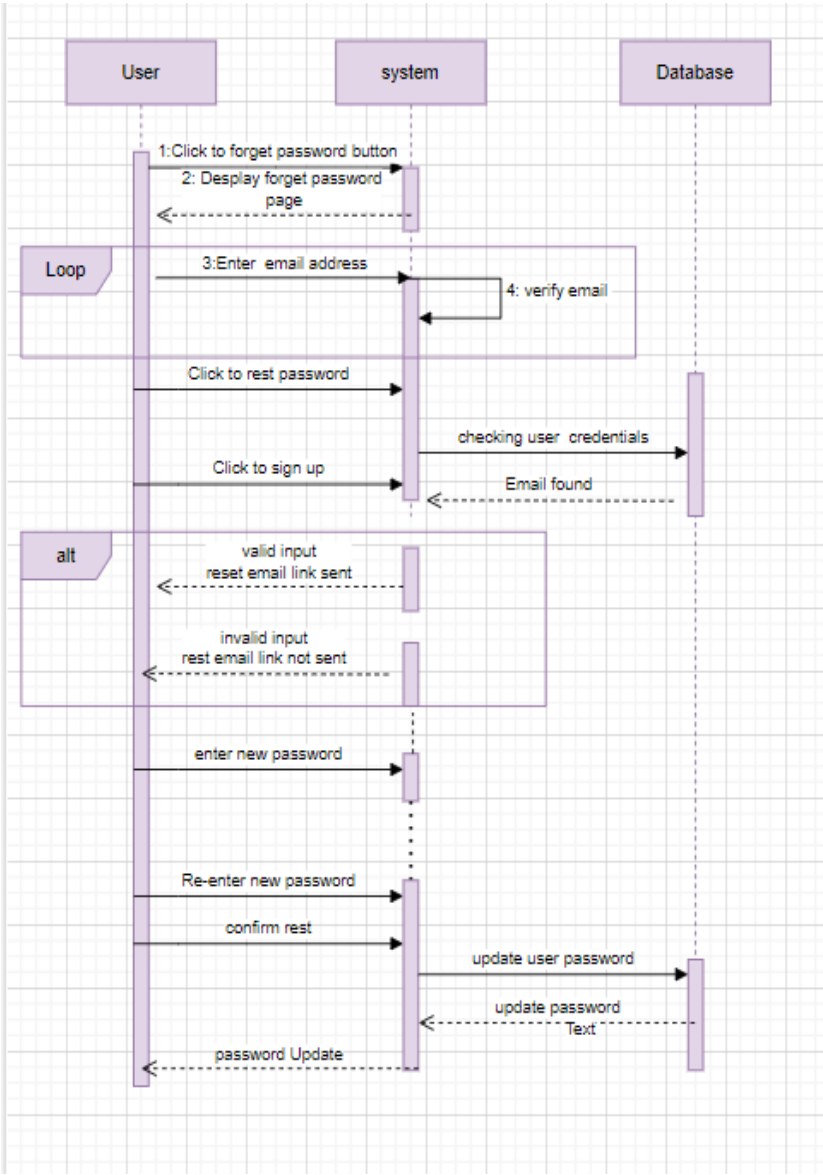


Figure 3.5: User Forget Password 1

3.8.5 Take Image

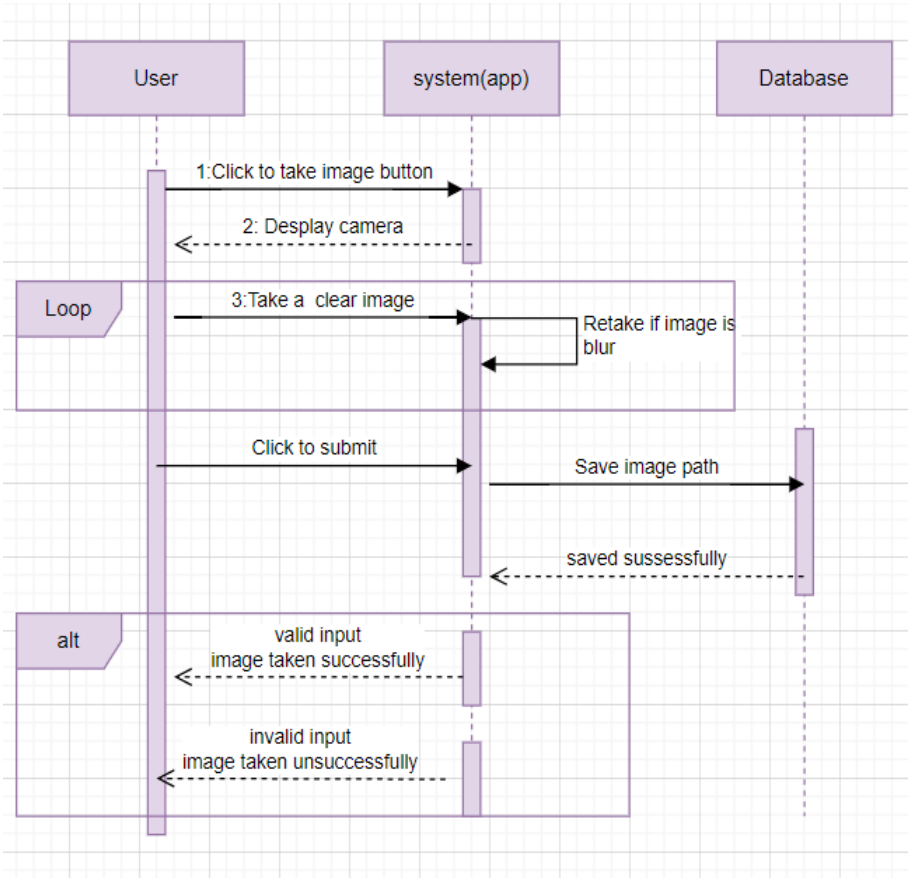


Figure 3.6: Take Image 1

3.8.6 Logout

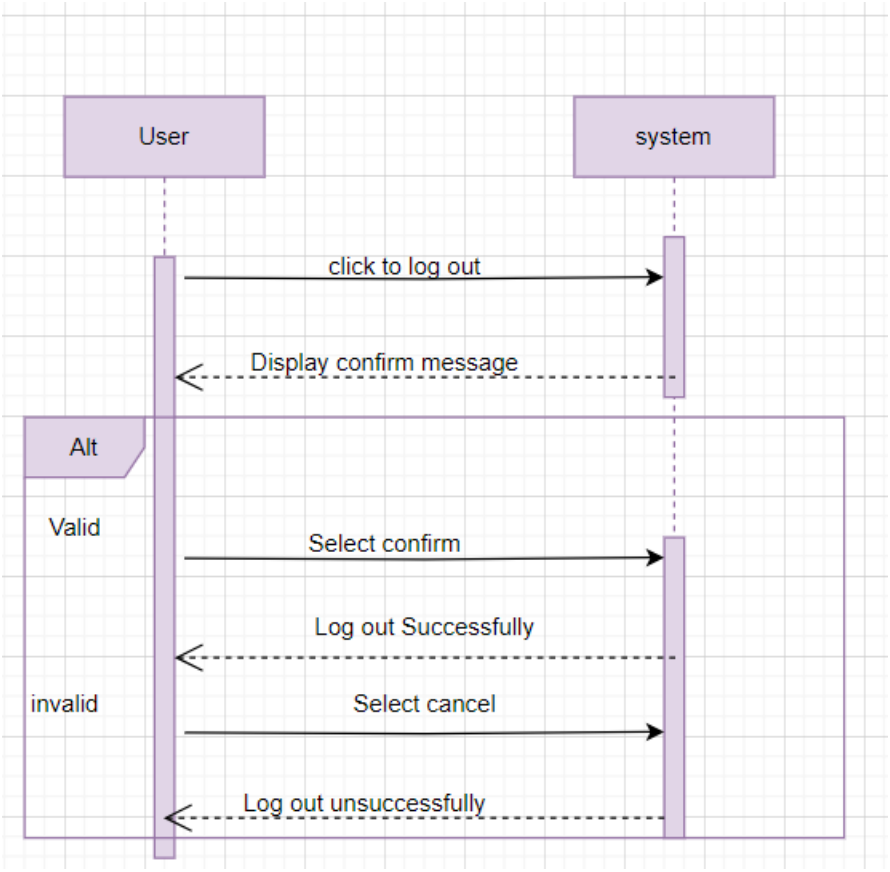


Figure 3.7: Logout 1

CNN Architecture diagram

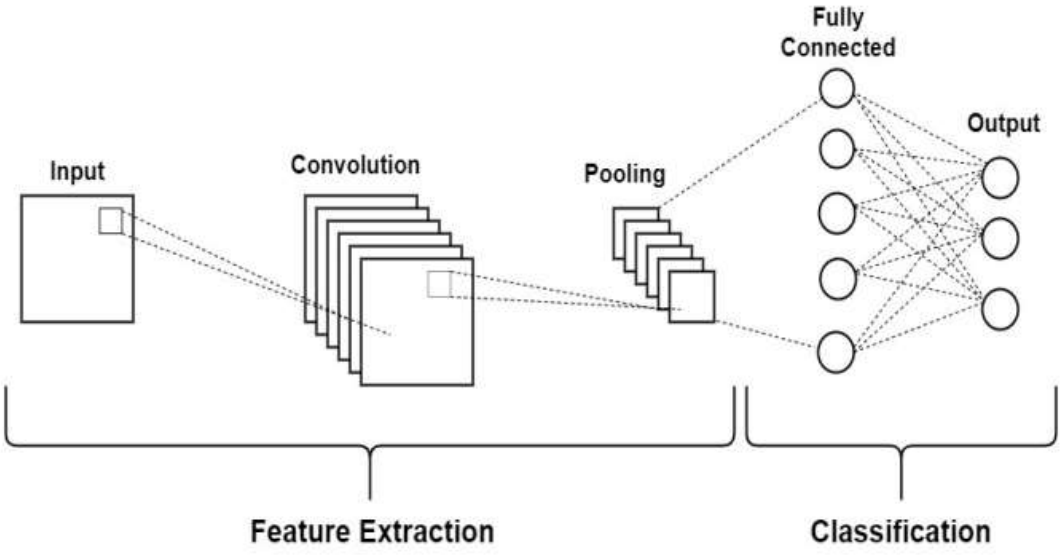


Figure 3.8: CNN Diagram 1

Chapter 4:

Implementation

Chapter 4: Implementation

4.1 Endeavor

4.1.1 Team

- **Abdul-Rehman**
- **Qazi Fahem**
- **Muhammad Furqan**

4.1.2 Roles & Responsibility Matrix:

The purpose of the roles & responsibility matrix is to identify who will do what.

Table 4.1: Responsibility Matrix 1

WBS #	WBS Deliverable	Activity #	Activity to Complete the Deliverable	Duration (# of Days)	Responsible Team Member(s) & Role(s)
#1	Feasibility Study	1	Research Work And performance study	15 Days	Abdul-Rehman, Qazi Faheem Ullah, Muhammad Furqan
#2	Front End Development	3	Choosing Front End Technology Working on Frame Work	40 Days	Muhammad Furqan
#3	Data Collection and Prepocesssing	4	Collecting data	50 Days	Abdul-Rehman, Qazi Faheem Ullah
#4	Model Development	5	Developing an Algorithm to achieve our desired Result	40-50 Days	Abdul-Rehman, Qazi Faheem Ullah
#5	Model Evaluation	6	Evaluating the model	20 Days	Abdul-Rehman, Qazi

					Faheem Ullah
#6	Backend Development	7	Backend work	60 Days	Muhammad Furqan, Abdul-Rehman
#7	Testing and Debugging	8	Performing testing and debugging techniques	15 Days	Muhammad Furqan, Abdul-Rehman

4.2Component, Libraries, Web Services and Stub

4.2.1 Flutter

Flutter is developed by google. It is an open-source UI software. It creates a single codebase cross-platform app for google, window, Linux, macOS and web.

4.2.2 TensorFlow

TensorFlow is the open source and free library that is used in AI and ML. it is used in different type of task but mainly in deep neural network.

4.2.3 Keras

Keras is also open-source software that is used in ANN. It serves as tenser flow library. keras support several back end up until version 2.3.

4.3 IDE, Tools and Technologies

- Android Studio
- Git hub
- Xamp Server
- MS Word

4.4 Database

- Firebase

4.5 Best Practices/ Coding Standards

During the development phase of our application, we will imply on following practices and coding conventions:

- Following Naming Conventions
- Keeping the code modularized by one widget per dart file.
- Avoiding Coded Literals
- Using Git for Version Control
- Avoiding Deep Nesting
- Using functions instead of repeated code.
- Promoting Single Responsibility Principle

4.6 Deployment Environment

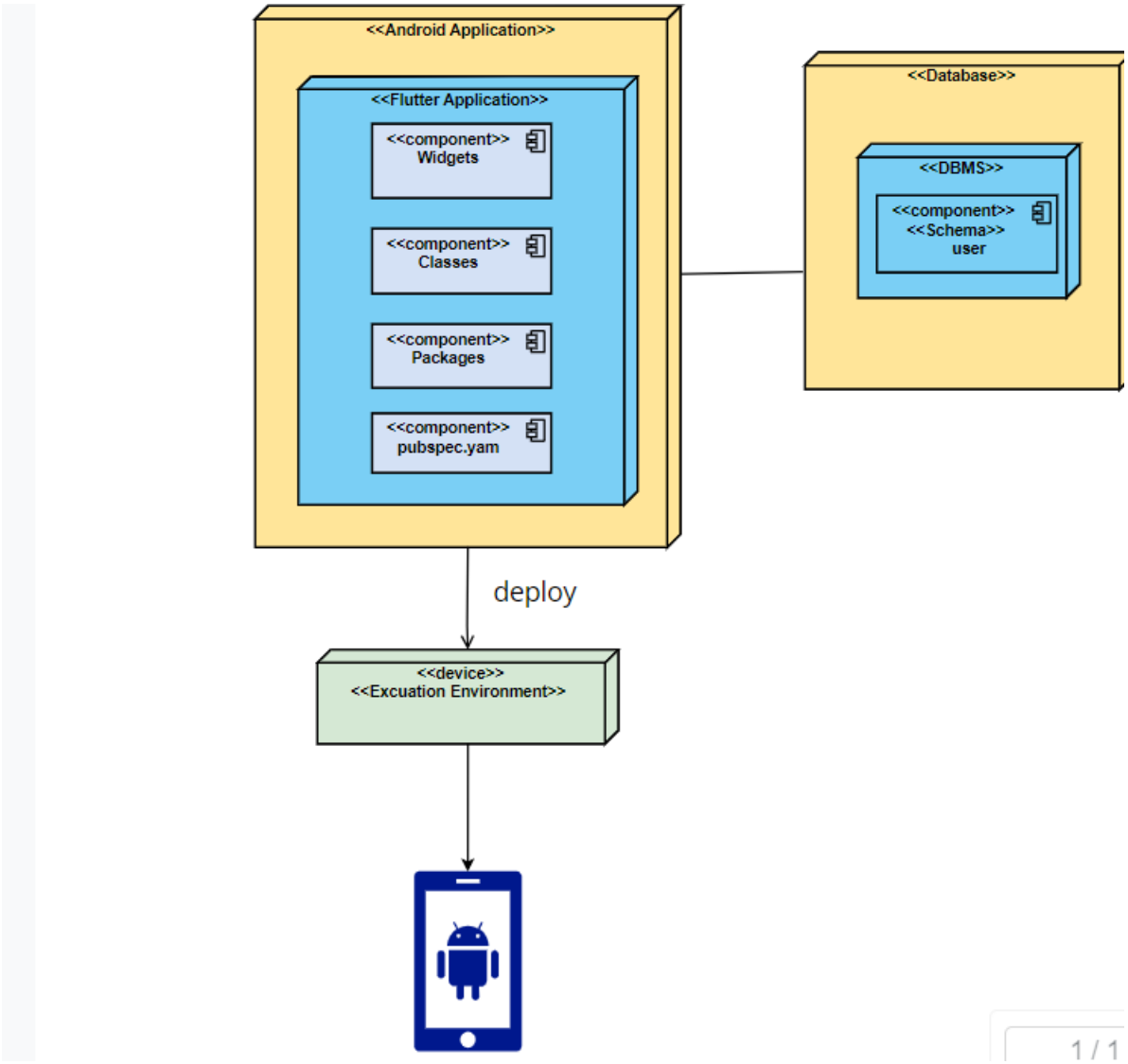


Figure 4.1: Deployment Environment 1

Chapter 5:

Experimental Result and Analysis

Chapter 5: Experimental Result and Analysis

5.1 Introduction

This chapter presents the experimental results obtained from the deployment and testing of the Fruit Life-Time Prediction. The application underwent a series of tests to evaluate its performance, usability, and effectiveness. Our project aims to provide initial support to customer to detect the fresh or rotten fruit through the camera and also check the fruit life. The past project is just detect fruit images but our project is also show the life of fruits.

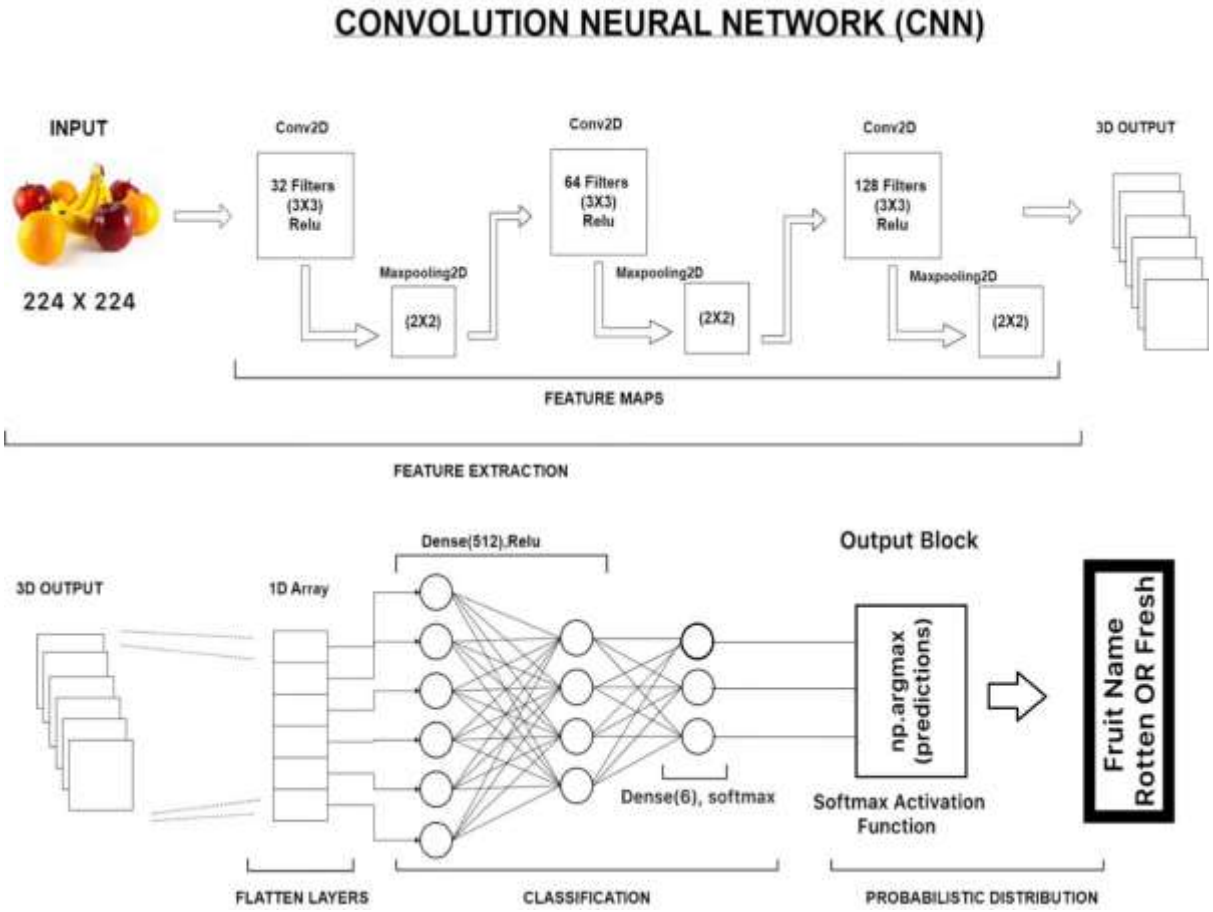
The main issue is the accuracy. Fruit Life-Time Prediction provides more accuracy than the other. To test the app we already performed many tests which include black box and white box. In this chapter, the major concern is to test the model and show you how accurate it is. We can show some confusion matrices to explain clearly.

5.2 Experimental Steps

In the methodology, the major issue is the dataset, we face many difficulties in the collection of datasets. After the collection of the dataset, we preprocessed the dataset to clean the data. We are working on 3 diseases with more than 10000 images. We can use the CNN algorithm to train the model because it provides more accuracy than the other.

CNNs use convolutional layers as their essential building elements. These layers are composed of learnable filters that are convolved with input images. This method extracts features such as edges, textures, and forms at various spatial scales. Pooling layers are used to down sample feature maps, lowering spatial dimensions while maintaining the most relevant information. Pooling aids in ensuring translation invariance while minimizing computing complexity.

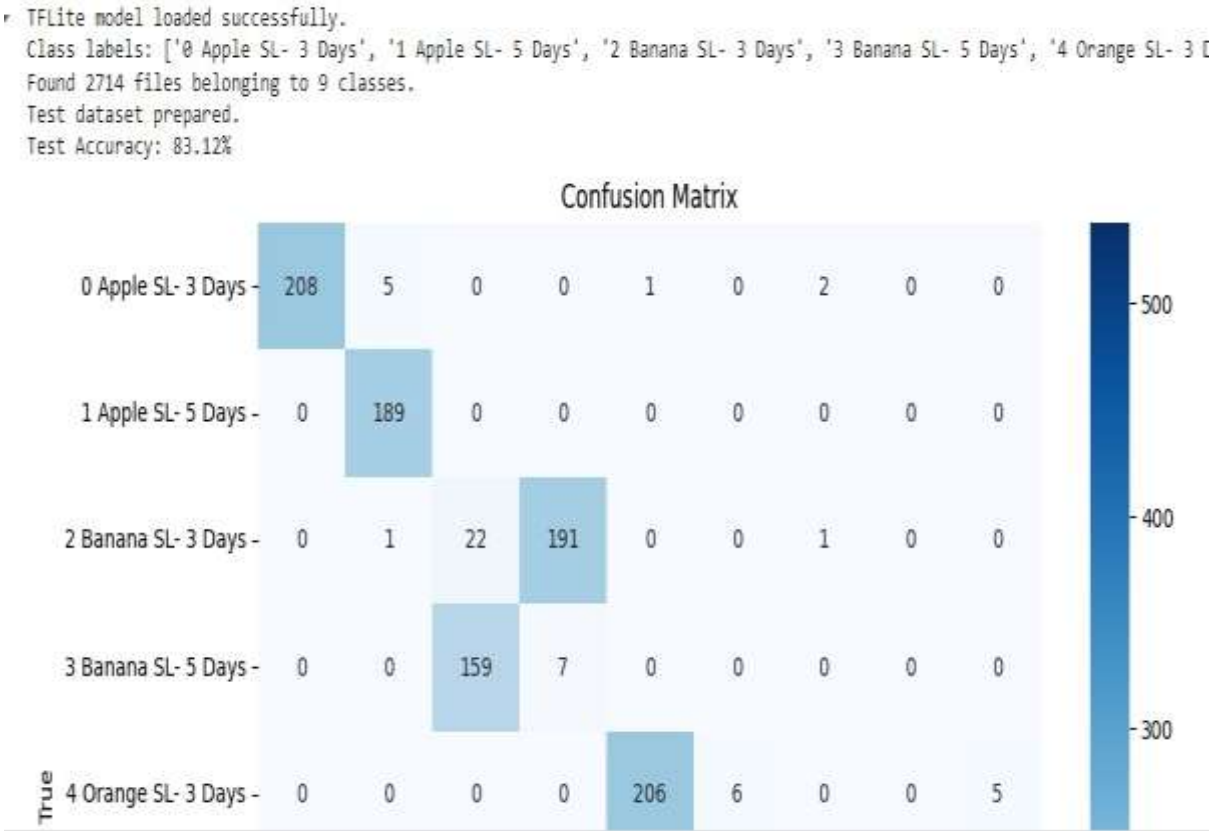
5.2.1 Working of CNN



5.3 Accuracy and Result

Accuracy is defined as the proportion of correctly classified occurrences out of all instances. In the context of an Fruit Life-Time Prediction system, accuracy refers to how often the system properly determines whether a fruit has a specific fresh or not. We can show the accuracy through confusion matrices. A confusion matrix illustrates the distribution of true positive, false positive, true negative, and false negative predictions, offering a detailed breakdown of the model's performance across different classes.

5.3.1 Confusion matrix



This matrix shows the accuracy of model which is 83.1%. Due to this matrix, we can easily identify the predicted label for the fruits. A confusion matrix depicts the distribution of true positive, false positive, true negative, and false negative predictions, providing a detailed breakdown of the model's performance in various classifications.

5.4 Summary

In this chapter we can disuse about experimental results and analysis. The model we built to detect fresh and rotten fruits showed good accuracy, especially for cataracts, where it correctly identified them 83.5% of the time. We can also use the confusion matrix to show the model accuracy. We can explain the working of CNN model.

Chapter 6:

Conclusion and Outlook

Chapter 6: Conclusion and Outlook

6.1 Introduction

From the beginning till the successful completion, we have analyzed this project, figured out our achievements, the improvements made, and how it is going to evolve in the future. The summary we are presenting also highlights the gaps in previous existing solutions that we have tackled quite successfully. Many hardships and challenges were faced during this time of completion. Our passion and feelings regarding successful closure have also been mentioned in this chapter.

6.2 Achievements and Improvements

The Fruit Life-Time Prediction project is the result of constant effort and teamwork. Many challenges were faced through the entire phase of requirement gathering from different aspects and development, an integration which we were able to overcome eventually. Goals are set and helped by team fluctuations, and work more efficiently in the allotted time. After going through all the existing systems with some similar features, we identified the gaps and features that need to be increased. Collaboration between stakeholders: customer and administrator. The experience we have gained by addressing the needs phase has helped us to learn, clarify, and implement development frameworks, and help us deal with AI, Flutter front-end designs and frameworks, etc. Our project supervisor has played an important role from day one until today. Finally, it helped us to meet these tasks and needs.

6.3 Critical Review

Our Project target is to help every person. The project aims to protect the money of people if they feel issues in fruits. Our system help people to detect the health of the fruit. With the help of our system customer can detect and check the life of fruit.

6.4 Future Recommendations/Outlook

The Fruit Life-Time Prediction project scope itself illustrates the need for future improvement and evolution. Our goal is to provide the best possible solution that enables us to adapt to new needs so that the system can easily adapt to the needs of this era. Although the system meets

the basic needs of all stakeholders. It has the potential to make a name for itself among the best fruit detection apps. In our next phase, we will improve the vulnerabilities of the system and add more features to it. For now, our system is solving the problem statement.

6.5 Summary

The system is smooth and performs efficiently the tasks assigned by the Customer and Admin. It is a platform that not only connects them but also builds a relationship of trust and confidence. At this stage, the project is ready to be used as a product or can be worked on as a business startup.

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[2] N. Sultana, M. Jahan, and M. S. Uddin, “An extensive dataset for successful recognition of fresh and rotten fruits,” *Data in Brief*, vol. 44, p. 108552, Oct. 2022, doi: https://doi.org/10.1016/j.dib.2022.108552.

[3] S. Chakraborty, F. M. J. M. Shamrat, Md. M. Billah, Md. A. Jubair, Md. Alauddin, and R. Ranjan, “Implementation of Deep Learning Methods to Identify Rotten Fruits,” *IEEE Xplore*, Jun. 01, 2021. https://ieeexplore.ieee.org/abstract/document/9453004 (accessed Nov. 03, 2021).

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